

Dr. Ronald Kulak
Senior Computational Structural Mechanics Project Leader

Professional Experience

RFK Engineering Mechanics Consultants (2005 to Present)

- Owner, State of Illinois, County of Du Page, Certificate No. 59674
- Provide consulting services to clients in the area of computational mechanics.
- Perform collaborative research with university professors in the areas of transient dynamics, numerical methods, parallel code development, meshfree methods, aircraft crash and structural reliability.

Argonne National Laboratory, Reactor Engineering Division (1974 to 2004)

Technical Advisor, Engineering Mechanics/Section Manager

- Directed the research of a staff of engineers and computational scientists developing state-of-the-art scalar and parallel computational methods (finite element and meshfree methods) and virtual reality applications.
- Developed and managed projects with the transportation industry: automotive (USCAR, Saginaw Division of General Motors) and railroad (DOT/University of Texas).
- Developed and managed projects with the International Nuclear Safety Center, the International Nuclear Safety Program, the Spallation Neutron Source. Managed LDRD's, CRADA's and WFO's.

Staff member

- Developed finite element methods and computer codes for the assessment of the structural integrity of reactor structures.
- Performed a large number of structural integrity evaluations for reactor components.
- Developed the Elastomer Testing Facility and conducted leading edge research on the mechanical response of elastomers used in seismic isolation bearings and designed and conducted a seismic isolation bearing testing program.

University of Illinois at Chicago (1975 to 1977 - concurrent with ANL position)

- Visiting Lecturer in the Materials Engineering Department. Taught undergraduate and graduate courses in finite elements and mechanical vibrations.

University of Illinois at Chicago (1970 to May 1974):

- Research Assistant in the Materials Engineering Department. Performed research on the mechanics of the human intervertebral disc and finite elements.

Goss Company, Cicero, Illinois (1964 to 1970):

- Senior Design Engineer in the Mathematical and Mechanical Analysis Section:
- Developed special purpose computer programs for dynamic analysis of high-speed printing machinery.
- Conducted in-house testing and field testing of new product designs.
- Developed and designed advanced folding blades for newspaper folding machines.

Registered Professional Engineer in the State of Illinois

Publication/Conference Paper/Proposal Reviewer (1974 to Present) for:

- PVP Division of the American Society of Mechanical Engineers
- 16 International Conference on Structural Mechanics in Reactor Technology
- 2nd Post-SMiRT Seminar on Impact

- Journal of Pressure Vessel Technology
- Nuclear Engineering and Design
- Nuclear Technology
- National Science Foundation
- U.S. Department of Transportation, National Highway Traffic Safety Administration

Education

Ph.D., Engineering Mechanics (1974), University of Illinois at Chicago
 M.S., Engineering Mechanics (1970), University of Illinois at Chicago
 B.S., Mechanical Engineering (1964), University of Illinois at Urbana

Publications

Thesis

R. F. Kulak, 1974, "A Study of Intervertebral Disc Mechanics by the Finite Element Method," University of Illinois at Chicago.

Books

Fluid-Structure Interaction - 1996 (1996) Eds., Wang, C. Y., Ma, D.C., Shin, Y. W., Kulak, R. F., Chang, F. C., Brochard, D., Moody, F. J., and Kaneko, F. J., ASME Special Publication PVP-Vol. 337.

Fluid-Structure Interaction and Structural Mechanics 1995 (1995) Eds., Wang, C. Y., Kaneko, S., and Kulak, R. F., ASME Special Publication PVP-Vol. 310.

Computational Aspects of Contact, Impact and Penetration (1991) Eds., Kulak, R. F. and Schwer, L. E., Elmeppress International, Lausanne, Switzerland.

Shock and Wave Propagation, Fluid-Structure Interaction, and Structural Response (1989) Eds., Shin, Y. S., Wang, C. Y., Colton, J. D. and Kulak, R. F., ASME Special Publication PVP-Vol. 159.

Peer-Reviewed Journal and Conference Papers — total of 74 publications have been authored. The following is a short list of relevant publications over a span of 30 years.

Petkevicius, K. and Kulak, R.F. (2007) "Stochastic Evaluation of Impact Loading on Reinforced Concrete Structural Elements," MECHANIKA-2007, Proceedings of the 12th International Conference, Kaunas University of Technology, Lithuania. In press

Dundulis, G., Kulak, R. F., Marchertas, A. and Uspuras, E. (2007) "Structural Integrity Analysis of an Ignalina Nuclear Power Plant Building Subjected to an Airplane Crash," Nuclear Engineering and Design. In press

Dundulis, G., Uspuras, E., Kulak, R. F. and Marchertas, A. (2007) "Evaluation of Pipe Whip Impacts on Neighboring Piping and Walls of the Ignalina Nuclear Power Plant," Nuclear Engineering and Design. In press

Petkevicius, K., Kulak, R., Marchertas, A. and Marchertas, P. (2006) "Application of Probabilistic Methods to Validate NPP Pipewhip Impact Simulations," Nuclear Engineering and Design, 236, 394-404.

Kulak, R. F., Petkevicius, K. (2006) "Probabilistic Evaluation of the Penalty Parameter Effect on the Response of Impacted Structures," MECHANIKA-2006, Proceedings of the 11th International Conference, Kaunas University of Technology, Lithuania, April 6-7, pp. 179-185.

Dundulis, G., Uspuras, E. and Kulak, R. F. (2005) "Structural Reliability of an Ignalina NPP Building Subjected to an Airplane Crash," Proceedings of the Structural Engineering Convention, Indian Institute of Science, Bangalore, India, December 14-16.

- Petkevicius, K., Kulak, R. F. And Marchertas, A. H. (2004) "Mixed Quadrature Rules for the Efficient Stabilization of the Mindlin Plate Element in High Energy Impact/Contact Problems," MECHANIKA-2004, Proceedings of the 9th International Conference, Kaunas University of Technology, Lithuania, April 16-20, pp. 211-217.
- Hsieh, B.J., Kulak, R.F., Price, J.H., and Murphy, B.T. (1998) "Transient Analysis of a Flywheel Battery Containment During a Full Rotor Burst Event," Eds. J.F. Cory, J.L. Gordon and Y. Narita, Finite Element Applications: Linear, Non-Linear, Optimization and Fatigue and Fracture, ASME Publication PVP-Vol. 370, pp. 101-106
- Kulak, R.F., Pfeiffer, P.A. and Plaskacz, E.J. (1997) "Modeling of Containment Structures on High Performance Computers," Nuclear Engineering and Design, 174 (2), pp. 143-156.
- Cho, Y. B., Plaskacz, E. J., Averill, R. C. and Kulak, R. F. (1997) "Explicit Dynamic Finite Element Analysis of Laminated Composite Automotive Structures Using a New Composite Plate Element," Eds., H. F. Mahmood, S. D. Barbat and M. R. Baccouche, Crashworthiness, Occupant Protection and Biomechanics in Transportation Systems-1997, ASME Publication AMD-Vol.225/BED-Vol. 38, pp. 73-106.
- Plaskacz, E. J. and Kulak, R. F. (1996) "Use of High-Performance Computers, FEA and the CAVE Automatic Virtual Environment for Collaborative Design of Complex Systems," Proceedings of the 1996 National Design Engineering Conference, McCormick Place, Chicago, IL, March 18-21, 1996, pp. 203-212.
- Kulak, R. F., Plaskacz, E. J. and Pfeiffer, P. A. (1995) "Structural Mechanics Computations on Parallel Computing Platforms," Eds. G. C. Mok and H. H. Chung, Seismic, Shock, and Vibration Isolation 1995, ASME Publication PVP-Vol. 319, pp.129-133.
- Plaskacz, E. J. and Kulak, R. F. (1995) "Numerical Simulation via Parallel-Distributed Computing of Energy Absorption by Metal Deformation," Proceedings of SAE Crash and Occupant Safety Conference, Detroit, MI, July 01.
- Kulak, R. F. (1989) "Adaptive Contact Elements for Three-Dimensional Explicit Transient Analysis," Computer Methods in Applied Mechanics and Engineering, 72, 125-151.
- Kulak, R. F. (1989) "Critical Time Step Estimation for Three-Dimensional Explicit Impact Analysis," Bulson, P. S., ed., Structures Under Shock and Impact, Elsevier Science Publishing Co. Inc., 155-164.
- Kulak, R. F. and Fiala, C. (1988) "NEPTUNE: A System of Finite Element Programs for Three-Dimensional Nonlinear Analysis," Nuclear Engineering and Design, 106 (1988), 47-68.
- Kulak, R. F. (1987) "Three-Dimensional Contact/Impact Methodology," Ammann, W. J., Liu, W. K., Studer, J. A. and Zimmermann, T., Eds., Impact: Effects of Fast Transient Loadings, A. A. Balkema Balkema Publishers, 183-200.
- Kulak, R. F. (1985) "Three-Dimensional Fluid-Structure Coupling in Transient Analysis," Computers & Structures, 21(3), 529-542.
- Kulak, R. F. (1984) "A Finite Element Quasi-Eulerian Method for Three-Dimensional Fluid-Structure Interactions," Computers & Structures, 18(2), 319-332.
- Kulak, R. F. (1982) "Some Aspects of Fluid-Structure Coupling," Eds., Y. W. Shin, F. J. Moody and M. K. Au-Yang, Fluid Transients and Fluid-Structure Interaction, ASME Publication PVP-Vol. 64, pp. 244-260.
- Schreyer, H. L., Kulak, R. F. and Kramer, J. M. (1979) "Accurate Numerical Solutions for Elastic-Plastic Models," Journal of Pressure Vessel Technology, 101, 226-234.

Kulak, R. F. (1979) "A Finite Element Formulation for Fluid-Structure Interaction in Three-Dimensional Space," Eds. M. K. Au-Yang and S. J. Brown, Dynamics of Fluid-Structure Systems in the Energy Industry, ASME Publication PVP-39, pp.21-37.

Kulak, R. F. and Belytschko, T. (1977) "Three-Dimensional Fluid-Structure Interaction Calculations," ed., Shi, G. C., Recent Advances in Engineering Science, Lehigh University Publication, 899-902.

Topical Reports

Over 30 internal ANL and client proprietary reports have been authored.

Professional Society Activities

American Society of Mechanical Engineers

U.S. Association for Computational Mechanics

International Association for Structural Mechanics in Reactor Technology

Anti-Seismic Systems International Society, Founding Member National/International Committees:

International Scientific Committee 16th International Conference on Structural Mechanics in Reactor Technology (SMiRT)

Organizing Committee for Division B - Computational Mechanics - of the 16th International Conference on Structural Mechanics in Reactor Technology

American Society of Mechanical Engineers Fluid Structure Interaction Committee

International Technical and Scientific Committee for the International Post-SMiRT 14 Conference Seminar on Seismic Isolation, Passive Energy Dissipation and Active Control of Vibrations of Structures

International Technical and Scientific Committee for the International Post-SMiRT 13 Conference Seminar on Seismic Isolation, Passive Energy Dissipation and Active Control of Vibrations of Structures

International Advisory Committee of the First U.S. National Congress on Computational Mechanics

International Advisory Committee of the Second U.S. National Congress on Computational Mechanics

Scientific Advisory Committee for the International Conference on Structures Under Shock and Impact

International Scientific Committee for the Second Post-SMiRT Seminar on Impact

International Association for Structural Mechanics in Reactor Technology (IASMiRT)

Awards and Honors

Fellow, American Society of Mechanical Engineers (1997)

Argonne Exceptional Performance Award (1996)

Argonne Pacesetter Award (1995)

Letter of recognition for contribution to USDOE Team Analysis of VVER buildings and structures, by Delbert Bunch, Principal Deputy Assistant Secretary for Nuclear Energy, USDOE, December 2, 1988.

University of Chicago Distinguished Performance Award (1984)

Pi Tau Sigma, Mechanical Engineering Honorary Society

Sigma Tau, Engineering Honorary Society

Sigma Xi, Scientific Honorary Society